

# DEVELOPMENT OF THE CENTRAL VALLEY CHINOOK SALMON IN-RIVER ESCAPEMENT MONITORING PLAN



*Alice Low  
Fisheries Branch  
Department of Fish and Game*

# WHY WE NEED ACCURATE CV ESCAPEMENT ESTIMATES

- Sustainably managing ocean and inland harvest
- Monitoring success of restoration programs
- Assessing the recovery of listed stocks
- Evaluating the contribution of hatchery fish

# **WHY WE NEEDED A MONITORING PLAN**

- Annual Spawner Escapement Estimated Since 1950's
- Programs have evolved Very Much over time; vary in methods, intensity of sampling effort, reliability of estimates
- Widely used mark/recapture carcass surveys known not to meet assumptions of models used
- Surveys not reviewed for statistical power or bias
- Data management and reporting not standardized

# **PLAN DEVELOPMENT**

- Interagency Salmon Escapement Project Work Team formed in 2001
- Developed proposal for CV Chinook Escapement Monitoring Plan
- Funded in 2007 by CALFED Ecosystem Restoration Program

# **MONITORING PLAN OBJECTIVES**

- Improve estimates of CV Chinook salmon spawning escapement and inland harvest, including statistically valid estimates of accuracy and precision
- Ensure accurate collection of biological data for estimation of age, length, and sex composition, and recovery of CWTs

# **PLAN DEVELOPMENT:**

## **2008 - 2011**

- Project team: biologist, database specialist, and statisticians (nationally recognized experts in mark-recapture methods)
- Reviewed existing programs, working closely with project biologists
- Recommended revised monitoring techniques, analytical methods
- Peer-reviewed throughout development

# EXISTING SACRAMENTO RIVER FALL-RUN SURVEYS



Monitoring  
Weirs/Device Counters:  
Mill, Deer, Battle,  
Cottonwood, Cow  
Creeks

Mark/Recapture Carcass  
Surveys:  
Mainstem Sacramento,  
Feather, Yuba, American  
Rivers, Butte, Clear  
Creeks

# **PLAN RECOMMENDATIONS: SACTO RIVER FALL-RUN SURVEYS**



- Monitoring Weirs/Device Counters:
  - Mill, Deer, Battle, Cottonwood, Cow Creeks – existing projects
  - Butte, Clear Creeks, Yuba River (upper) – new projects
  
- Mark/Recapture Carcass Surveys:
  - Mainstem Sacramento, Feather, Yuba (lower), and American Rivers



# **PLAN RECOMMENDATIONS: MARK-RECAPTURE CARCASS SURVEY ANALYSIS METHODS**

- Previous models used: Pooled Petersen, modified Schaeffer
  - A simple, closed population analysis, requiring constant population (no in or out)
  - Citations are a mystery (modified Schaeffer)
- Simulations showed the previous models performed very poorly

# **PLAN RECOMMENDATION: CORMACK JOLLY SEBER MODEL**

- Open population model
- Doesn't require equal mixing of tagged/untagged
- Can account for heterogeneity in capture probabilities (e.g., fish size, sex)
- Simulations showed estimates using CJS were very close to actual population sizes

# 2011 PLAN IMPLEMENTATION

- DPD Dam/device counter used to monitor most of the lower Yuba River
- All Sacramento River fall-run carcass surveys used field methods consistent with use of CJS model
- In January 2012, 2-day workshop assisted in application of CJS model:
  - American, Feather, Lower Yuba Rivers, Clear Creek (modified Schaeffer)
  - Butte Creek (Petersen)
  - Mainstem Sacramento River (JS)

# EFFECT OF APPLICATION OF CJS MODEL – 2011 DATA

- Concerns over comparability to previous years' data:
  - Compared estimates for mark-recapture carcass surveys using both CJS and former models
  - No changes to other survey methods, or direct counts at hatcheries

# 2011 ESCAPEMENT COMPARISON: CJS vs. PREVIOUS MODELS

	CJS ESTIMATES			PREVIOUS METHOD		
	Grilse	Adults	Total	Grilse	Adults	Total
Feather River	10,443	32,531	42,974	11973	37297	49,270
Yuba River	325	1,014	1,339	432	1,348	1,780
American River	7,919	13,484	21,403	11,175	19,027	30,202
Butte Creek	188	229	417	428	522	950
Clear Creek	771	4,070	4,841	1,007	5,325	6,332
SAC FALL-RUN	85,719	114,741	200,460	91,088	126,932	218,020
TOTALS						
	6% higher	10.6 % higher	8.7 % high			

# 2011 METHODS USED TO DISTINGUISH AGE 2/ADULTS

- Length/frequency analysis with CWT verification:
  - 2011 data – Mainstem Sacto, Clear Creek
  - Past 10 years' data – CNFH
  - 2010 data – American River and Nimbus Hatchery
- Fixed length cutoff:
  - Butte, Mill, Cow, Cottonwood, Deer (video monitoring)
  - Feather River and Hatchery, Yuba River

# **SUMMARY**

- We believe that the recommendations in the monitoring plan are the best available science for CV Chinook escapement monitoring
- We have included the CJS estimates in the SRFC data submitted for the 2012 ocean harvest management season
- We will continue to monitor the effects of Plan implementation in various management areas

